

organic radicals on the potassic compound of pyrol, by Signori Ciamician and Dennstedt.—Contributions to the anatomy of leaves (continued), by S. Briosi.—On linear differential equations, by S. Casorati.

La Natura, January, 1882.—Considerations on some relations between the velocity of efflux, the specific heat, and the mean squares of the molecular velocity of gases, by Dr. Nachs.—On the rapidity with which light modifies the electric resistance of selenium, by Prof. Bellati and Dr. Romanese.—On the products of electrolysis of various acid and alkaline solutions, with graphite electrodes, by Dr. Bantoli and Regrasogli.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, December 8.—“The Vibrations of a Vortex Ring, and the Action of Two Vortex Rings upon each other.” by J. J. Thomson.

The first part of the paper contains a discussion of the vibrations which can occur in the figure of a vortex ring, whose cross-section is small compared with its aperture. It is proved that if the equations to the circular axis of a vortex ring are—

$$\rho = a + a_n \cos nt \\ z = \beta_n \cos nt$$

ρ being the distance of a point on the circular axis from the straight axis, and z the distance of the point from the mean plane of the circular axis, then—

$$a_n = A \cos \left(\frac{\omega e^2}{2a^2} \log \frac{2e}{a} n \sqrt{n^2 - 1} t + B \right) \\ \beta_n = A \frac{\sqrt{n^2 - 1}}{n} \sin \left(\frac{\omega e^2}{2a^2} \log \frac{2e}{a} n \sqrt{n^2 - 1} t + B \right)$$

where ω is the angular velocity of molecular rotation, and e the radius of the cross-section of the vortex core; e is small compared with a .

Thus the time of vibration for such a displacement in the circular axis is—

$$2\pi / \frac{\omega e^2}{2a^2} \log \frac{2e}{a} n \sqrt{n^2 - 1}$$

or if T be the velocity of the vortex—

$$= 2\pi a / T n \sqrt{n^2 - 1}$$

This shows that a vortex ring with small cross-section of core is stable for all displacements of its circular axis. Sir W. Thomson has proved that it is stable for all alterations in the shape of the cross-section of its core.

The second part of the paper contains an investigation of the action of two vortices upon each other when the shortest distance between them is large compared with the diameter of either of the vortices. The amount of the disturbance each vortex experiences is worked out in the paper, but it may be sufficient to quote here the general effect of the collision which is given by the following rule:—the vortex which first passes through the point of intersection of the direction of motion of the two vortices is deflected towards the direction of motion of the other, is increases in radius and energy, and its velocity of translation is diminished, the other vortex is deflected in the same direction as the first, it diminishes in radius and energy, and its velocity of translation is increased.

“On Melting Point.” By E. J. Mills, D.Sc., F.R.S. (Abstract.)

The author gives a list of twenty-three aromatic compounds, the melting-points of which he has determined in terms of the air thermometer. The average probable error of a single result is about 0.015. The numbers obtained, which range from 42° to 121°, obviously represent a set of thermometric standards, free from most of the grave inconveniences presented by the ordinary mercury-glass thermometer. In some cases they are shown to be proportional to the numerical value of the formula, a law which, it is suggested, may be in the limit the real law of melting-point. The original memoir contains a full description of apparatus and methods.

Royal Society, January 12.—“On the results of Recent Explorations of Erect Trees containing Reptilian Remains in the Coal Formation of Nova Scotia,” by J. W. Dawson, C.M.G., LL.D., F.R.S., &c.

The explorations referred to were carried on chiefly in the

beds at Coal Mine Point, South Joggins, Nova Scotia; and their object was to make an exhaustive examination of the contents of erect trees found at that place and containing remains of Batrachians and other land animals.

A detailed section is given of the beds containing the erect trees in question, with lists of their fossil remains. The most important part of the section is the following:—

	Ft.	In.
Sandstone with erect <i>Calamites</i> and <i>Stigmaria</i> roots	6	6
Argillaceous sandstone, <i>Calamites</i> , <i>Stigmaria</i> , and <i>Alethopteris Cuchitica</i>	1	6
Gray scale, with numerous fossil plants, and also <i>Naiadites</i> , <i>Carbonia</i> , and fish scales	2	4
Black coaly shale, with similar fossils	1	1
Coal, with impressions of <i>Sigillaria</i> bark	0	6

On the surface of the coal stand many erect *Sigillaria*, penetrating the beds above, and some of them nearly three feet in diameter at the base and nine feet in height. In the lower part of many of these erect trees there is a deposit of earthy matter, blackened with carbon and vegetable remains, and richly stored with bones of small reptiles, land snails, and millipedes. Detailed descriptions of the contents of these trees are given, and it is shown that on decay of the woody axis and inner bark they must have constituted open cylindrical cavities, in which small animals sheltered themselves, or into which they fell and remained imprisoned. These natural traps must have remained open for some time on a sub-aerial surface.

In all twenty-five of these erect trees had been discovered and extracted, and the productive portions of them preserved and carefully examined. Of these fifteen had proved more or less productive of animal remains. From one no less than twelve reptilian skeletons had been obtained. In a few instances not only the bones, but portions of cuticle, ornamented with horny scales and spines, had been preserved.

The Batrachians obtained were referred to twelve species in all. Of these two were represented so imperfectly that they could not be definitely characterised. The remaining ten were referable to the two family groups of *Microsauria* and *Labyrinthodontia*.

The *Microsauria* are characterised by somewhat narrow crania, smooth cranial bones, simple or non-plaited teeth, well-developed limbs and ribs, elongated biconcave vertebrae, bony scales and plates on the abdomen, and horny scales, often ornate, on the back and sides. They show no traces of gills. The species belonging to this group are referred to the genera *Hylonomus*, *Smilerpeton*, *Hylerpelon*, and *Fritschia*. The characters of these genera and of the several species are given in detail and illustrated by drawings and photographs, including microscopic delineations of the teeth of all the species, with their internal structure and the microscopic structure of their bones, as well as representations of their cuticular ornamentation and armour.

The Labyrinthodonts are represented by only two species of *Dendrerpeton*, which are also described and delineated.

About half of the reptilian species described are new, and those previously described from fragmentary remains are now more fully characterised, and their parts more minutely examined.

The invertebrate animals found are three species of land snails and five of myriapods, besides specimens supposed to represent new species of myriapods and insect larvæ, not yet fully examined, and which have been placed in the hands of Dr. Scudder, of Cambridge, U.S.

The memoir, consisting in great part of condensed descriptions of the facts observed, does not admit of much abridgment, and cannot be rendered fully intelligible without the accompanying plans, sections, and drawings. It closes with the following general statement:—

“The negative result that, under the exceptionally favourable conditions presented by these erect trees, no remains of any animals of higher rank than the *Microsauria* and *Labyrinthodontia* have been found deserves notice here. It seems to indicate that no small animals of higher grade inhabited the forests of Nova Scotia at the period in question; but this would not exclude the possibility of the existence of higher animals of a larger size than the hollow trees were capable of receiving. Nor does it exclude the possibility of higher animals having lived contemporaneously in upland situations remote from the low flats to which our knowledge of the coal formation is for the most part confined. It is to be observed also that as some of

the reptilian animals are represented only by single specimens, there may have been still rarer forms, which may be disclosed should other productive trees be exposed by the gradual wasting of the cliff and reef."

Physical Society, Jan. 28.—Dr. Stone, in the chair.—New Member, Mr. W. Lant Carpenter.—Mr. T. Wrightson read a paper by himself and Pro. W. Chandler Roberts, F.R.S., on the fluid density of metals. The results were obtained by the process described in a former paper to the Society, on the fluid density of bismuth. The mean results were for copper, 8.217; lead, 10.37; tin, 7.025; zinc, 6.487; silver, 9.51; iron (No. 4 Foundry, Cleveland), 6.88. These results are slightly less than those given by Mallet's process, but they are sufficiently close. For bismuth the fluid density found by the authors is 10.055, which is slightly more than that given by Mallet's method (9.82). The authors consider their method satisfactory. It consists in suspending a ball of the solid metal from a spiral spring, and allowing it to dip into a crucible of the same metal in a molten state. The movements of the spring as the ball melts are recorded by a pencil on a band of travelling paper.—Mr. C. Vernon Boys read a paper on apparatus for calculating efficiency. The object of such machines is to automatically divide and continuously record the quotient of the speeds with which two things are turning. If the two things are the records of two of Boys' integrating machines (previously described to the Society), one finding work put into, and the other work sent out from any combination of mechanism, then the quotient gives the efficiency of the combination. If one measures work or current, and the other time or turns of a machine, the quotient measures the value of horse-power per hour or current per turn. Mr. Boys described four machines of the kind acting on two principles, from which he names them logarithmic and harmonic dividers. They all derive their actions from motions of pure rolling. The simplest is made by hanging a magnetised steel reel on to a pair of iron cones, which are turned by integrators. The reel travels about and continuously shows the value of the quotient.—Mr. Boys then read a paper on a *new current meter*. The rate of a pendulum clock depends on gravity, and is proportional to the square root of the strength of gravity. That of a watch depends on the strength of the hair-spring, and is proportional to the square root of its strength. The force due to an electric current is proportional to the square of the current strength. Hence if part of an electric circuit is capable of vibrating under electromagnetic force, the speed of vibration will be proportional simply to the current strength, for the square of the speed measures the force, and the force is proportional to the square of the current. If, then, such a contrivance takes the place of the balance of a pendulum-clock, the clock will measure electric currents instead of time. To keep the indications true, the maintaining power must be so contrived that the amplitude does not vary much, or the parts must be so arranged that the force is directly proportional to the displacement. Mr. Boys showed several ways of producing a controlling power. The first was a combination of solenoids, one passing through the other, and in which the force was proportional to the displacement. Being without iron, it applies to the case of alternating currents. In another a small armature is mounted on the balance staff, and around it are the two poles of an electromagnet, which forms part of the circuit. In a third form, which is unaffected by residual magnetism, two crescent-shaped pieces of iron forming the sides of the balance pass through two fixed solenoids. In all these cases the direction of the current does not matter. The maintaining power may be any ordinary escapement drawn in the usual way. It may also be independent of clockwork, an impulse being given to the balance electrically at each swing. A meter of this kind was shown in which the controlling power depends on iron crescents and solenoids, and in which a portion of the main current is shunted through secondary solenoids when the balance is in its neutral position; at which time a variation in the currents in the controlling solenoids has no effect in disturbing the period of oscillation. Such a meter is regulated by an adjustable weight, if it goes too fast or slow. Being independent of gravity it will work equally well anywhere. Prof. John Perry thought Mr. Boys' devices very promising, and mentioned that Prof. Ayrton and he had invented a very simple current meter not yet described. Dr. Coffin pointed out that electric clocks of a certain class were really current meters. Prof. Guthrie remarked that in Mr. Boys' meter practically no work was taken from the current. Reference was made by Dr. Stone and Mr. Lecky to Hipp's clocks,

the latter testifying to their efficiency.—Capt. Abney, R.E., then exhibited some experiments on the phenomenon of phosphorescence. Balmain's luminous paint, calcium sulphide, and other substances give out a violet light after having been excited by daylight. Capt. Abney found that when the spectrum was allowed to fall on an excited surface of Balmain's paint the blue rays enhanced this violet light, and the red end of the spectrum extinguished it. This was shown to the meeting, and the red end of the spectrum appeared on the paint in well-defined black bands. Similarly, the light from an electric lamp passed through a sheet of red glass extinguished the phosphorescence. Capt. Abney's researches further showed that there is a series of octaves in the blue end of the spectrum which refuse to quench the violet light. He found the mean wave-length of the rays exciting the phosphorescence to be 4300. Prof. Guthrie also showed that calcium sulphide tubes glow in violet light.

Anthropological Institute, January 10.—Major-General Pitt-Rivers, F.R.S., president, in the chair.—Hugh Felvey and Mrs. Bathoe were elected Members of the Institute.—Mr. Bryce-Wright exhibited a series of sixteen portraits of the Incas, copied from the originals in the Temple of the Sun.—Mr. Worthington G. Smith exhibited some stone implements from the north-east of London.—General Pitt-Rivers, F.R.S., read a paper on the entrenchments of the Yorkshire Wolds, and excavations in the earthwork called Dane's Dyke, at Flamborough. At Dane's Dyke the author had found flints and flint flakes, clearly proving that the constructors and defenders of the earthwork used flint, and lived not later than the bronze period. The whole district was the scene of the operations of a people much earlier than the Danes, and therefore the term "Dane's Dyke" was a misnomer.—In the absence of the author the Director read a paper by Mr. J. R. Mortimer, on the discovery of ancient dwellings on the Yorkshire Wolds.

Institution of Civil Engineers, January 24.—Mr. Brunlees, vice-president, in the chair.—The paper read was on "The Analysis of Potable Water, with special reference to the determination of Previous Sewage Contamination," by Mr. Chas. W. Folkard.

SYDNEY, N.S.W.

Linnean Society, November 30, 1881.—Dr. J. C. Cox, president, in the chair.—The papers read were: By the Hon. Secretary, for Baron F. von Mueller, K.C.M.G., on two new species of New South Wales plants.—By J. J. Fletcher, M.A., B.Sc., on the existence after parturition of a direct communication between the median vaginal cul-de-sac, so called, and the uro-genital canal in certain species of kangaroos.—By the Hon. William Macleay, F.L.S., on two new species of snakes from the western interior of New South Wales. Mr. Macleay stated that these new species had been discovered by Mr. James Ramsay, of Tyndarie, near Bourke; they were a new species of *Diemenia*, which it was proposed to call *D. ferox*, and a new species of the genus *Aspidotes*, named *A. Ramsayi*, after its discoverer.—By the Rev. Wm. Woolls, Ph.D., on the flora of New South Wales, being the sixth paper on this subject by this well-known botanist.—On the Cypree of New Caledonia, by Mr. J. C. Rossiter, of Numea, N.C.; communicated through Mr. John Brazier, C.M.Z.S.—On a new species of *Therapon*, *T. Macleayana*.—On two new birds from the Solomon Islands: (1) a kingfisher, *Halcyon salmonis*, allied to *H. chloris*, but without the white nape patch or superciliary stripe; and all the under surface white, the under-wing coverts white, the upper surface of a much brighter blue; (2) a Rhipidura, *R. tenebrosa*.—On the habitats of *Pachycephala olivacea* and *Pycnophilus floccosus*, and their occurrence near Sydney, by Mr. E. P. Ramsay, F.Z.S., C.M.Z.S., Curator of the Australian Museum.—Exhibits.—Mr. Ramsay exhibited specimens of the following new and rare birds from the Island of "Ugi," in the Solomon groups:—1. *Ptilopus Eugenia*, Gould. (2) *Ptilopus Lewisi* (Ramsay), similar to *P. Eugenia*, but without the white head. 3. *Ptilopus Richardsii* (Ramsay), a very remarkable species, having the head, neck, and breast of a light french grey, tinged slightly with pale olive yellow, the crown is of a very pale lilac, the scapulars beautifully painted with rose down the centre of each feather. 4. *Ptilopus Johannis* (Sclater), said to be identical with *P. ceraseipectus* of Canon Tristram, and of which *P. solomonensis* of Gray is the female. 5. *Chalcophaps mortoni* (Ramsay) resembles *C. chrysocollora*, but has no shoulder patch, and is larger. 6. *Trichoglossus (Charmosyne) Margaretha* (Tristram), male and female, the female alone being previously

known, the male differs in having no yellow on the sides of the uropygium, this part being crimson, like the flanks and belly. 7. *Nasiterna finschi* (Ramsay), males and females; the male is distinguished by having a stripe of red down the abdomen, and the feathers round the lower mandible more distinctly tipped with blue; *Rhipidura tenebrosa* (Ramsay) being of a dull olive brown, with a few white-tipped feathers on throat and sides of the head.—Dr. J. C. Cox, F.L.S., exhibited several specimens of wood carvings from the Solomon Islands; also two drills used by the natives of Rubiana in building their canoes, and a fish-trap made of cordage, used by the natives of the same island.—Mr. Brazier exhibited a very fine collection of *Cypræa*, viz.:—*Cypræa hirundo* 2, *neglecta* 2, *cylindrica* 2, *errones* 3, *moneta* 4, *lynx* 5, var. *Caledonica* 1, *Isabella* 1, *caurica* var. *obscura* 3, *stolida*, var. *Crossei* 2, *Arabica* 7, *vitellus* 4, *scurra* 1, *staphylea* 1, *mappa*, var. *nigricans* 2. These fourteen species were all distorted or malformed, with the extremities rostrated, and the base arched. Three fine varieties of *C. tigris*, four fine varieties of *C. crebarrina*, and one fine pink variety of *C. mappa*. These three species are normal.—The Hon. William Macleay exhibited dried specimens of the two plants described by Baron Müller, also a large peculiarly-shaped gall of a manna-producing coccus on a gumtree branch, and a rare heteromorphous beetle (*Zopherosis Georgii*), both sent by Mr. Palmer. Mr. Macleay also exhibited some samples of a bark said to be used by the natives of New Caledonia and New Hebrides to procure abortion, and a mass of a kind of gutta-percha from a new Caledonia tree. These two exhibits were sent by Mr. E. L. Layard, C.M.G., British Consul, Noumea. Mr. Fletcher exhibited a large number of microscopic sections. A special vote of thanks was awarded that gentleman for his very valuable paper on the uro-genital organs of the kangaroo.

PARIS

Academy of Sciences, January 30.—M. Jamin in the chair.—The following papers were read:—On the theory of repeated proofs, by M. Bertrand.—On some applications of the theory of elliptic functions, by M. Hermite.—On a criticism in the last number of *Memoirs* of the Italian Society of Spectroscopists (p. 256), by M. Faye. M. Tacchini says there is not perfect parallelism between spots and protuberances. M. Faye (who regards these phenomena as in mechanical connection) contends that from the nature of the observations this is not to be looked for, but merely a general accord.—*Résumé* of meteorological observations made during 1881 at four points of Haut-Rhin and the Vosges (continued), by M. Hirn. The great excess of water which falls in the higher regions is met by the useful regulative action of mountain forests; and disastrous results have followed the extensive destruction of wood on the Vosges.—On various problems of relative motion, by M. Gilbert. He analyses the action of M. Sire's polytropic, gyroscopic pendulum, &c.—On the hematic crisis in acute maladies with sudden defervescence, by M. Hayem. This crisis, occurring near the end of acute disease, is chiefly characterised by a temporary increase of hemato-blasts in the blood; in forty-eight hours their number is nearly doubled; in twenty-four hours more it diminishes considerably, and ere long the normal state is recovered, in which there is about one hematoblast to twenty red corpuscles. The abnormal ratio between these elements at the time of greatest accumulation of hemato-blasts is represented nearly always by the same figure (seven on the average; variation limited between eight and six). The hematic crisis indicates an effort of sanguineous reparation.—On a class of binomial linear differential equations with algebraic coefficients, by M. Appell.—The death of M. Billet, Correspondent in Physics, was announced.—On the oscillatory character of the cause producing the variable distribution of spots on the sun's surface, by M. Spoerer (with annotations by M. Faye). M. Spoerer's data (here tabulated) with M. Carington's, prove that the sun-spot activity (which is concentrated between 6° and 35°) advances slowly from 35° towards the equator, increasing to a maximum at 18°; then proceeds, with diminution, to 5° or 6°, where it disappears. A new cause now brings out some spots in the higher latitudes again, and the same series is reproduced. M. Spoerer calls attention also to an alternating preponderance of each hemisphere in production of spots (but this is less marked).—On asymptotic integrals of differential equations, by M. Boussinesq.—On the generation of surfaces and curves with double curvature of all degrees, by M. Vanecsek.—On the combination of carbonic acid and water, by M. Wroblewski. His results obtained in com-

pressing and liberating carbonic acid in contact with water, point he thinks, to the existence of a hydrate of carbonic acid, easily dissociable, and producible by pressure (like M. Ogier's chlorhydrate of phosphide of hydrogen). The critical pressure which must be produced in order to the phenomenon occurring is the tension of dissociation of the hydrate formed.—Silicomolybdic acid, by M. Parmentier.—On new combinations of aldehydes with iodide of phosphonium, by M. de Girard.—On the vapour-density of chloride of pyrosulphuryl, by M. Ogier.—On the formation of an aldehyde-acetone and a glycol of the aromatic series, by M. Burcker.—Researches on pilocarpine, by M. Chastaing.—On the relations of the vasomotor system of the *medulla oblongata* with that of the spinal cord in man, and on the alterations of these two systems in the course of sensitive *tubercles*, by M. Pierret.—On the formation of blighted grains of wheat, by M. Prillieux.—Attempt at reproduction of Wollastonite and of Meionite, by M. Bourgeois.—On a multiplying anemometer applicable to measurement of the velocity of wind in mining galleries, to meteorological observations and to determination of the velocity of water-courses, by M. Bourdon. This is a system of convergent divergent tubes. In one such tube, made according to Venturi's proportions, is fixed concentrically a second much smaller, and having its divergent end exactly at the point where the truncated summits of the cones of the larger tube unite. (For very small velocities a third tube may similarly be fixed within the second.) A hollow sleeve is fixed round the union of the truncated cones of the wide tube; its interior communicates with that of the latter and with a manometer, on which the pressure is read. If a manometer at the mouth of the large tube register 1 with a current, the other manometer will register e.g. 6; the pressure here is negative and due to acceleration of the velocity of the current.—On some atmospheric phenomena observed during the recent period of high pressures, by M. Vinot. General de Nansouty, on the Pic du Midi, records exceptional purity of sky; the zodiacal light was seen on January 1 (a very rare thing), and the earthshine and thin crescent of the moon, only 25h. 46m. old, were also seen in January.—Observations in a balloon, of the opaque cloud which covered the Paris region for some days, by M. de Fonvielle. The cloud was hardly 300 m. thick. In the upper part the guide rope got covered with hoar-frost. The temperature of the cloud was about 5° below zero.—Relief map of France, on the scale of 1:300,000, by M. Guillemin.

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